

## **Forensic Anthropological Examinations**

### **1 Scope**

This document describes general guidelines for forensic anthropological examinations by Anthropology Examiners within the Trace Evidence Unit (TEU). This document also outlines general evidence handling and documentation procedures, and types of information that can be obtained from anthropological examinations. Procedures for specific types of forensic anthropological examinations are contained in separate documents.

### **2 Equipment/Materials/Reagents**

- Sliding calipers capable of measuring items up to 200mm within +/- 0.5mm (Mitutoyo Digimatic Absolute Digital Calipers 500-172-20 CD-8" CX or equivalent)
- Spreading calipers capable of measuring items up to 300mm within +/- 0.5mm (Paleo-Tech Digital Linear Spreading Calipers with Mitutoyo Digimatic Absolute Digital Scale 572-213-10 or equivalent)
- Osteometric board (Paleo-Tech Field Osteometric Board, or equivalent)
- Mandibulometer (Paleo-Tech Mandibulometer or equivalent)
- 3-dimensional digitizer (MicroScribe G2 LX or equivalent)
- Tape measure
- Personal protective equipment (lab coat, gloves, eye protection , as needed)
- Stereobinocular microscope, magnification range from 0.5x to at least 40x
- Sectioning/wafering saw (Isomet Precision Saw or equivalent)
- Microscope for Histology with associated measuring devices
- X-Ray Fluorescence Spectrometer (EDAX Eagle III XXL micro x-ray fluorescence spectrometer, or equivalent)
- Digital camera (Nikon D70, or equivalent)
- Digital radiography unit (NorthStar X-5000 X-radiography unit, Kubtec radiography unit or equivalent)
- FORDISC 3.0 or more recent version
- Reversible adhesive (Paraloid B-72 or equivalent)
- Permanent adhesive (cyanoacrylate or equivalent)
- Water bath
- Nylon brush (e.g., toothbrush)
- Human skeletal reference casts
- Probe, scalpel, forceps
- Hot plate (capable of bringing water almost to the boiling point)
- Sandbox (capable of accommodating and stabilizing human bones and fragments)

- Sand
- Wooden struts
- Detergent (Tergazyme or equivalent)

### **3 Standards and Controls**

Not applicable.

### **4 Sampling**

Not applicable.

## **5 Procedure**

### **5.1 Preparing Skeletal Material for Examination**

**5.1.1** The examiner will conduct an inventory of the skeletal remains or material present. Depending on the material(s) present and number of items and/or number of individuals present, this inventory may be recorded on a Dental Chart (Appendices A, B) and/or Skeletal Inventory Form (Appendix D), as appropriate. Each item or its primary packaging will be labeled in accordance with the FBI Laboratory Operations Manual – Practices of Processing a Submission and Evidence Breakdown.

**5.1.2** Photographs, with a scale included, will be taken prior to any examination or processing that may alter the evidence. Photographs may also be taken to record important features or evidence at the discretion of the examiner.

**5.1.3** Any soft tissue or other substances or debris adhering to the remains that obstructs the analysis may be removed by skeletal processing. Any associated debris that may require further examination (e.g., hairs, soil) will be recorded, removed, and packaged appropriately for further analysis by appropriate personnel.

**5.1.4** Fragmented bones will be reassembled to the extent possible when appropriate. In cases where reassembly will be facilitated by affixing fragments (such as extreme fragmentation or a large number of specimens), reversible adhesives and stabilizing equipment such as sand and struts may be used.

### **5.2 Anthropological Examinations**

The following anthropological examinations may be performed depending on the nature of the request and/or the condition of the material present. Procedures for these examinations and how to reach possible conclusions are contained in technical procedures specific to each:

- Determining Skeletal or Non-skeletal Origin
- Determining Human or Non-Human Origin
- Bone Histomorphology
- Estimation of Biological Profile
- Resolving Commingled Skeletal Remains
- Personal Identification
- Trauma Analysis
- Facial Approximation
- Assessment of Medicolegal Significance of Human Skeletal Remains
- Assessment of Taphonomic Alterations
- Operational Response and Field Assessments
- Assessment of Images
- Skeletal Processing
- Use of Microscribe Digitizer

Identification comparisons involving the comparison of questioned (postmortem) and known (antemortem) skeletal information (i.e., those falling under the comparison section of the Personal Identification procedure) require verification. The verification procedure is contained within that document.

The techniques used for these analyses may include visual examination, metric analysis, microscopic examination, radiologic examination, or elemental analysis.

### **5.2.1 Macroscopic (Visual) Examination**

An anthropological analysis will include a macroscopic (or visual) examination of skeletal material using sufficient lighting. In some cases, only a macroscopic examination may be necessary. The general condition of skeletal remains and relevant features will be recorded in the case notes.

### **5.2.2 Metric Analysis**

Where applicable, relevant and available skeletal measurements will be taken according to relevant published guidelines using calipers, osteometric board, tape measure, and mandibulometer and may be recorded on the Forensic Skeletal Measurements Form (Appendix C). Measurements may also be collected using a 3D digitizer. Where applicable and with the consent of the contributor, these data will be submitted to the Forensic Data Bank. Additional measurements, such as those documenting trauma, will be taken and included in the case notes. Calipers, mandibulometers, osteometric boards used in the procedure are serviced and calibrated annually by an external vendor.

### **5.2.3 Microscopic Examination**

When greater magnification is required for adequate analysis, the material may be examined using a stereobinocular microscope. Microscopic examination may also involve preparing thin sections of the material using a wafering saw and viewing with a compound microscope. For preparing and analyzing bone thin sections, refer to the Bone Histomorphology procedure.

### **5.2.4 Radiologic Examination**

When radiologic examination of the material is necessary, (e.g., to reveal the internal structure of skeletal material or look for the presence of foreign material) digital radiography will be used. For taking radiographs, examiners will refer to and follow the Chemistry Unit, Metallurgy, Digital Radiography procedure or other appropriate instrument-specific procedures.

### **5.2.5 Elemental Analysis**

If the determination of elemental composition of the material is required to ascertain whether the submitted evidence/material is osseous (bone) or dental (tooth) in origin (versus some other non-osseous or non-dental material), the material will be examined using X-Ray Fluorescence Spectrometry (XRF). For XRF analysis, refer to and follow the appropriate Chemistry Unit, Metallurgy procedure(s) regarding x-ray fluorescence spectrometry.

## **5.3 Examination of Images**

The examination of images (including photographs and digital images) is typically for the purpose of providing timely lead information regarding whether material is skeletal or non-skeletal in origin, or whether it is human or non-human in origin. Examination of other types of images (such as those from autopsy reports) may be performed on a limited, case-by-case basis. The conclusions that can be reached based on the examination of images are dependent on the condition and completeness of the skeletal material as well as the quality of the images. Results may be limited or inconclusive. If limited or inconclusive, the examiners may recommend that the material be submitted to the FBI Laboratory for direct analysis.

## **5.4 Odontological Examinations**

In cases where an odontological examination is requested and/or deemed appropriate by the examiners, the odontological examination may be performed by a competent subcontractor according to the FBI Laboratory Quality Assurance Manual.

## 5.5 Reporting

Results will be reported in an FBI *Laboratory Report* (7-1, 7-1 LIMS) according to the procedures for the specific examinations (e.g., Estimation of Biological Profile, Trauma Analysis) and the Trace Evidence General Approach to Report Writing. Where applicable, a description of the analytical method(s) used and associated limitations will be included in the report. Examples of limitation wording may be found in the “Limitations” sections of the specific examination procedures.

Any information that is outside the scope of the procedure for the specific examinations that may aid in an identification or investigation (e.g., suggestions for database entry) may be included in the report under a section entitled “Remarks.”

In the event that human skeletal remains are determined to be not of medico-legal significance (e.g., archaeological contexts, disturbed cemeteries, anatomical collections, ceremonial remains, trophy skulls), this will be indicated in the report. In addition, where appropriate, contributors will be advised that the dispensation of the submitted items may be subject to state and federal regulations (e.g., Native American Graves Protection and Repatriation Act).

Externally provided odontological examinations will be included as an attachment to the anthropological report or as an attachment to a supplemental anthropological report, as appropriate.

## 5.6 Evidence Return

Upon completion of anthropological examinations, the evidence will be returned to Evidence Management Unit personnel for a multiple unit submission or mailed to the contributor for a single unit submission.

## 6 Calculations

**6.1** Calculations carried out as part of a biological profile will be performed according to appropriate reference data. Refer to the Estimation of Biological Profile procedure.

**6.2** Calculations may be carried out manually or through the use of software including FORDISC. The source(s) of the formula(e) and calculations used will be recorded in the case notes.

## 7 Measurement Uncertainty

**7.1** The measurement uncertainty with calipers is approximately  $\pm 0.02$  mm or better, depending on the caliper used. Refer to instrument manuals for uncertainty for a particular

caliper. This degree of uncertainty of measurement does not significantly affect anthropological conclusions and is not detrimental to the results of anthropological examinations.

**7.2** The measurement uncertainty with an osteometric board is approximately  $\pm 0.5$  mm. This degree of uncertainty of measurement does not significantly affect anthropological conclusions and is not detrimental to the results of anthropological examinations.

**7.3** The measurement uncertainty with the MicroScribe digitizer is less than 0.3 mm. This degree of uncertainty of measurement does not significantly affect anthropological conclusions and is not detrimental to the results of anthropological examinations.

## **8 Limitations**

The conclusions that can be reached from anthropological examinations are dependent on the condition and completeness of the remains, and the availability and quality of antemortem data. Limitations specific to particular examination may be found in the associated technical procedures.

## **9 Safety**

**9.1** While working with physical evidence, laboratory personnel will wear at least the minimum appropriate protective attire (e.g., laboratory coat, safety glasses, protective gloves).

**9.2** Universal precautions will be followed.

**9.3** Exposure to biological and radiological hazards may be associated with the examination techniques performed. Safety procedures related to specific instruments or equipment (e.g., wafering saws, x-ray units) will be followed. Refer to the FBI Laboratory Safety Manual for guidance.

## **10 References**

- FBI Laboratory Quality Assurance Manual (current version)
- Trace Evidence General Approach to Report Writing, Trace Evidence Quality Manual (current version)
- Digital Radiography Procedure, Chemistry Unit, Metallurgy (current version)
- Operation of the Thermo QUANT'X X-Ray Fluorescence Spectrometer Procedure, Chemistry Unit, Metallurgy (current version)

- Operation of the Olympus Delta Premium Handheld X-Ray Fluorescence Spectrometer, Chemistry Unit, Metallurgy (current version)
- FBI Laboratory Operations Manual (current version)
- Determining Skeletal or Non-skeletal Origin, Trace Evidence Procedures Manual (current version)
- Bone Histomorphology, Trace Evidence Procedures Manual (current version)
- Determining Human or Non-Human Origin, Trace Evidence Procedures Manual (current version)
- Estimation of Biological Profile, Trace Evidence Procedures Manual (current version)
- Resolving Commingled Skeletal Remains, Trace Evidence Procedures Manual (current version)
- Personal Identification, Trace Evidence Procedures Manual (current version)
- Trauma Analysis, Trace Evidence Procedures Manual (current version)
- Facial Approximation, Trace Evidence Procedures Manual (current version)
- Operational Response and Field Assessments, Trace Evidence Procedures Manual (current version)
- Assessment of Taphonomic Alterations, Trace Evidence Procedures Manual (current version)
- Assessment of Medicolegal Significance of Human Skeletal Remains, Trace Evidence Procedures Manual (current version)
- Image Assessment, Trace Evidence Procedures Manual (current version)
- Use of Microscribe Digitizer, Trace Evidence Procedures Manual (current version)
- Skeletal Processing, Trace Evidence Procedures Manual (current version)
- FBI Laboratory Safety Manual (current version)

Rev. #	Issue Date	History
3	12/16/2019	Updated Scope. Changed forensic anthropologist to Anthropology Examiner in Scope and to examiner throughout document. Updated Section 5.2 to include what examinations require verification.
4	08/02/2021	Retitled Section 5.1 Deletion of portions of 5.1.3 which are now captured in a new procedure. Section 5.2 revised to reflect changes to procedure titles and new procedures. Revision of 5.2.3. to reflect compound microscopy with histomorphological examination. Added limited to last sentence in 5.3. Addition of new procedures to References. Removed statement regarding relevant settings in Sections 5.2.3 through 5.2.5. Changed standard operating procedures to technical procedure, procedure, or document throughout.

**Approval**

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Trace Evidence Unit Chief:

Date: 07/30/2021

Anthropology Technical  
Leader:

Date: 07/30/2021

## **Appendix A: *Anthropology Adult Dental Chart***

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**Appendix B: *Anthropology Deciduous Dental Chart***

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**Appendix C: *Anthropology Forensic Skeletal Measurements Form***

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**Appendix D: *Anthropology Skeletal Inventory Form***

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